TCC Proposal: How To Effectively Use SRS in the Elementary Classroom

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Abstract: Digital natives, born after 1980 and raised in a digital world, are avid digital multitaskers and are accustomed to technological devices as an integral part of their daily lives. Yet digital natives are in schools that struggle with technology to keep them engaged, motivated, and actively learning. A potential engaging technology called Student Response Systems (SRS) was investigated throughout this project. The purpose of this study was to explore whether teachers can create a lesson using the Interactive SRS Lesson Plan Template. Specifically, the intent of the module was to demonstrate the benefits of using SRS and encourage teachers to implement SRS into their daily routines. Subjects included 10 elementary teachers with little or no experience using SRS. Quantitative data collected through a pre, embedded, and post test revealed that participants met majority of the objectives in the module and scores increased by 33% in the post test. Qualitative data was collected using a demographic and attitudinal survey. The data revealed that participants generally felt more comfortable with SRS and agreed that it is a valuable tool to use in the elementary classroom as it improves feedback to students, improves the learning environment, and enhances learning and engagement.

Introduction

Digital natives are children who were born after 1980 and raised in a digital world. Digital immigrants adapted to the Internet whereas digital natives are born into a world of digital communication technologies (Palfrey & Gasser, 2008). The dilemma for digital natives is that they are avid digital multitaskers and are accustomed to technological devices as an integral part of their daily lives, yet they are in schools that do not use technology to keep them engaged, motivated, and actively learning. Over the past four decades, educators have recognized the value of using technology in the classroom and since then have made many attempts to provide 21st century learning opportunities for their students (Fouts, 2000).

To increase student and teacher interaction, as well as engagement and active learning strategies, this instructional design project incorporated a technology called Student Response Systems (SRS). The purpose of this study was to explore whether teachers can create a lesson plan using the Interactive SRS Lesson Plan Template, which was developed initially as the Backward Design Lesson Plan by Tomlinson & Jay McTighe (2006) and modified for this study. Specifically, the intent of the module was to demonstrate the benefits of using SRS and encourage teachers to implement SRS into

their daily routines. This project helped to address the growing need to integrate technology effectively in the elementary classroom.

Background

SRS are an interactive technology that allows for ongoing formative assessments by enabling the teacher to pose questions and receive student answers immediately, which can then be displayed electronically for students to self assess (Johnson & McLeod, 2004). According to research findings in higher education, SRS has a significant impact on college student motivation and engagement (Hall, Collier, Thomas, & Hilgers, 2005). Features that contribute to motivation and engagement include response anonymity, speed of response collection, and the ability to share visual representations that help enhance recognition (Roshelle, 2003). Though little, the subset of research available on the role of K-12 classroom SRS effects is very valuable. SRS have been increasingly adopted in K-12 and higher educational environments as cost and equipment are becoming more feasible (Edens, 2009).

SRS is only a technological tool that cannot function on its own. The instructor using SRS needs to focus on the strategies he or she is using to implement the tool appropriately. SRS can be a successful as long as certain pedagogical principles are addressed. "Ultimately, … the pedagogical practices of the instructor, not the incorporation of the technology [is] key to student comprehension" (Judson & Sawada, 2002, p. 167). According to Beatty, Gerace, Leonard, and Dufresne (2005), creating effective questions, refining productive classroom activity, and effectively integrating SRS with the current curriculum are the hard parts. "Telling student[s] what to think is notoriously ineffective; eliciting their thinking, confronting it with alternatives, and seeking resolution works better" (Beatty et al., 2005, p. 33). To develop quality questions when using SRS in an educational environment, Beatty et al. (2005) place emphasis on considering the steps within the "question cycle" model. These steps include three important aspects: 1) questions are presented in an encouraging significant cogitation, rather than just recalling facts, 2) questions are followed by detailed discussions, first with small groups then as a whole class, 3) the instructor continues adjusting the lesson to the needs of the learners—a term referred to as "agile teaching." (Beatty et al., 2005). Using this "question cycle model," teachers can design questions to be used with SRS that meet the needs of the learners and offer meaningful and genuine learning experiences.

When SRS are used in conjunction with effective questioning, discussion, and feedback—the technology "constitutes a powerful catalyst for conceptual change, heightened student engagement in class, and, because involvement and feedback for all students is equal" (Penuel, Boscardin, Masyn, & Crawford, 2007, p. 316). Furthermore, Caldwell (2007) determined that SRS increased students' participation by giving all students, including those who are more reserved, an opportunity to answer questions posed by the teacher. Also, using SRS helps to avoid calling on the same students since SRS forces every student in the classroom to respond anonymously (Ribbens, 2007). This form of anonymity provides the students with the courage to participate more actively.

Researchers conclude that once students submit their answers through SRS, they become emotionally invested in the problem and are more inclined to pay deeper attention to the successive lecture (Beatty, 2004). Students self reported that they enjoyed using SRS and claimed to be more attentive in class, which resulted in better understanding of course concepts (Judson & Sawada, 2002). Research on SRS in educational environments reveal potential on improving classroom learning. Although much research remains to be done to explicate why SRS are effective tools in the classroom, SRS does appear to enhance learning by creating an active learning environment, increasing participation, and increasing student enjoyment (Caldwell, 2007).

Methods

Instructional Module Development: The ADDIE model was used as a framework to design the module and Gagne's Nine Events of Instruction was utilized to address the conditions of learning. The module was delivered through instructional videos. Video was determined to be the best delivery method as it provided the learner with both visuals and audio elements. Keynote presentation software was used to create the video, which was then exported to QuickTime movie files. The movie files were then organized on a website using iWeb, which was then published to a CD-ROM. The instructional module was organized into the following four chapters: Chapter 1: The Basics of Lesson Planning, Chapter 2: The Basics of SRS, Chapter 3, Part 1: Questioning Design Part 1, Chapter 3, Part 2: Questioning Design Part 2, and Chapter 4: Terminal Objective. Each chapter was sequenced in an order that builds upon previous skills.

Target and Test Audience: The instructional module was designed for elementary teachers who had an interest in fostering and providing meaningful 21st century learning opportunities for their students. All participants were volunteers who understood the need to integrate technology into the classroom, as an integral part of students' daily routines. These teachers were aware that technology should not just be an "add on" and proper pedagogical strategies must be used when technology is implemented to be effective and meaningful. Additionally, the demographic survey revealed their interest in learning more innovative methods for engaging and motivating their students to be active participants.

Twenty eight teachers were asked to participate, of which 12 consented. Ten completed all components. The subjects in this small group included seven elementary teachers ranging in age from 25-59 years of age and three student teachers ranging in age from 21-32 years of age. Eight of these participants are teaching at the same elementary school and the other two are teaching at another nearby local elementary school. All participants possessed basic to advance computer technology skills and use computer technology in their classrooms regularly with students. However, only a few of them had prior experience using SRS. Most of their technology application in the classroom included using the Internet for web-based information searching, using online reading, writing, and arithmetic programs. All participants expressed a general feeling towards a need to integrate technology effectively into their curriculum, however felt inadequate about their

pedagogical skills using technology. Participation in this study was entirely voluntary, hence subjects were viewed as enthusiastic and eager participants.

Implementation and Protocol Procedures: Consent forms and demographic surveys were first distributed to all prospective participants. Two weeks later, the pre test was distributed to all participants who signed and completed the consent form and the demographic survey. Participants were given five days to complete the pre test before the one-hour module session took place. At a common location and time, all participants met to proceed through the instructional design modules. The location was equipped with 10 laptop computers and Internet access. During the one-hour module session, after proceeding through each chapter, the participants answered a series of questions from their supplementary test packet. Participants were also given a feedback packet, which contained all the correct answers with a short explanation. The post test and attitudinal survey were distributed at the conclusion of the module session to each participants and collected five days later.

Instruments: A paper-based method was used to deliver the demographic survey, pre test, embedded test, post test, and attitudinal survey. In order to assess the participants' knowledge of the Interactive SRS Lesson Plan Template, quantitative data was collected through criterion-referenced tests, including a pre, embedded, and post test. The pre test assessed any prior knowledge before participation in this study. The embedded test served as a mode of practice for participants to apply their new skills immediately while proceeding through the module. Furthermore, the post test assessed participants' knowledge and skills of all the concepts presented in the module. The attitudinal survey served as a reflective and insightful instrument that collected information regarding the participants personal opinions related to the module. Each test included a series of multiple-choice questions that aligned with each performance objective. Additionally, questions across all three tests were parallel to one another. Each test included a culminating activity that involved the participant to complete the SRS Lesson Plan Template by filling in sections of the template. Each multiple-choice question was given 1 point if answered correctly and 0 points if answered incorrectly. The attitudinal survey included 19 four point Likert scale questions and five open-ended questions regarding their participation and feelings toward the instructional design project and SRS.

Data Analysis: According to the demographic survey a high majority (80 percent) of participants agreed that technology motivates and engages students in the learning process, however only 30 percent of the participants rated their technological skills as proficient or experts. Ninety percent of participants felt strongly about wanting to use technology more often in their classrooms.

Results

Quantitative Data: Quantitative data collected through a pre, embedded, and post test revealed that participants met majority of the objectives in the module. The average mastery level was 59 percent for the pre test, 86 percent for the embedded test, and 92 percent in the post test. This data showed an increase of 33% in post test from the pre

test. The average mastery level for each test question illustrated in figure 1, displays each test separately. Figure 1 also revealed that participants performed better on the terminal objective questions (questions 22 through 28) on the post test compared to both the pre and embedded tests.

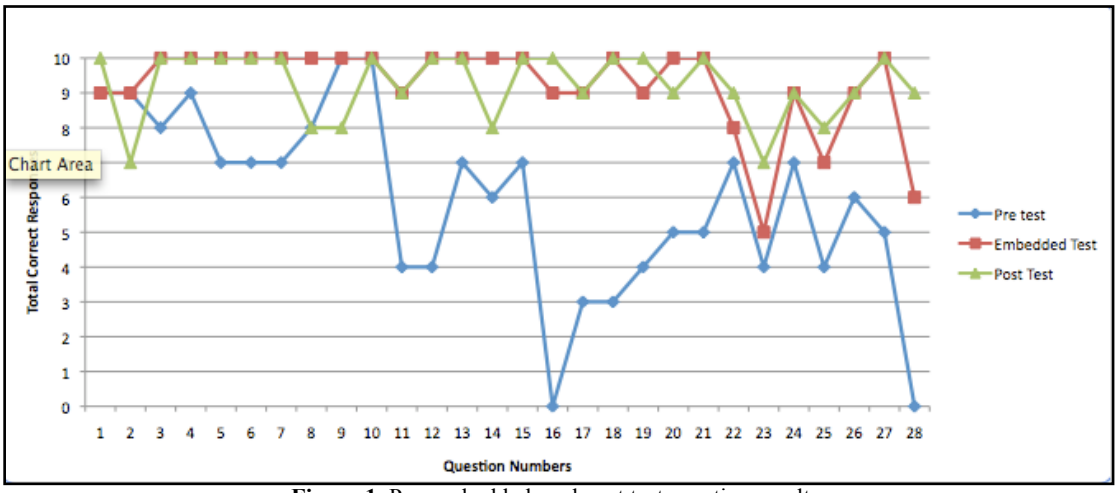

Figure 1. Pre, embedded, and post test question results

Two anomalies were illustrated in figure 1 for questions 2 and 9. For both questions, on average, participants did not perform as well on the post test compared to their performance on the pre and embedded test. After analyzing the test questions, the researcher postulates that the drop in correct responses for questions 2 and 9 may be due to a problem with the multiple-choice options. Question 2 asked:

2. Which one of the following items describes formative assessment?

a. Provides instructors with holistic test results and feedback based on pre, embedded, and post test.
b. Provides diagnostic feedback to students and instructors at short-term intervals including observations and peer assessment.
c. Provides a description of students' level of attainment upon completion of an activity, module, or course.
d. Provides scores that are used for accountability for schools (adequate yearly progress) and students report cards.

The correct answer is "b." However, distracter "d" was commonly mistaken probably because some teachers may actually use formative assessments to help them determine student's report card grades. This possibility was not considered when designing the multiple-choice options. Question 9 asked:

9. Which one of the following criterion belongs to the final stage in the backward design template?

a. Determine appropriate instructional activities
b. Determine appropriate collective evidence
c. Determine appropriate instructional strategies
d. Determine appropriate terminal objectives

The correct answer is "a," however option "c" is worded very similarly and was commonly mistaken as the correct answer resulting in decreased performance.

Figure 2 revealed that participants' overall scores in the embedded and post test improved from the pre test.

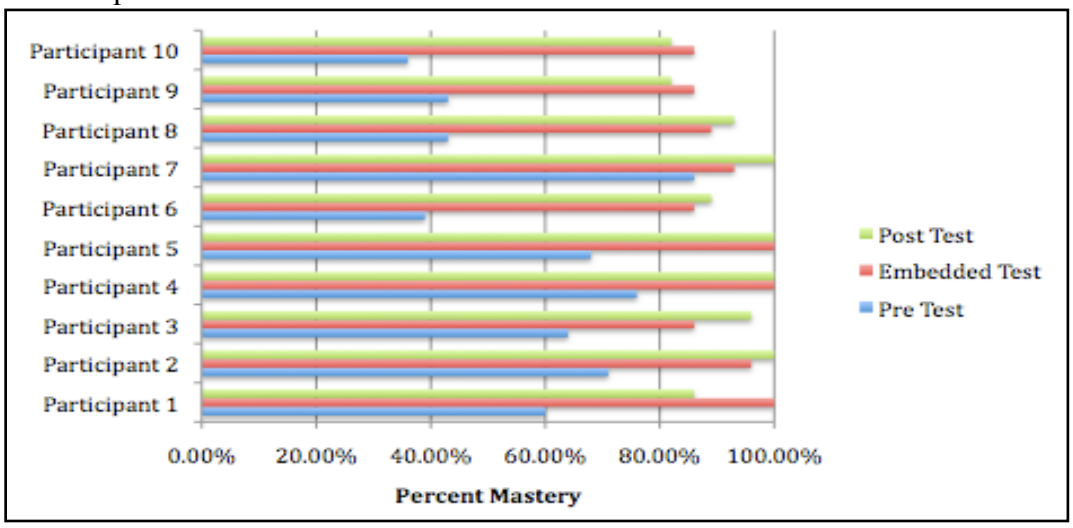

Figure 2. Participants' scores on pre, embedded and post test

Qualitative Data: Figure 3 illustrates that participants generally had positive feelings toward the module's instructional delivery and content. However, there were some neutral feelings toward participants' personal outcomes. Ten percent of participants responded neutral to the following statements: I have learned new pedagogical strategies on how to use SRS effectively, I am now more likely to use SRS in my classroom, I feel more comfortable and confident about using SRS in my classroom, I feel students will be more engaged in the learning process when SRS are used. The remaining 90 percent either strongly agreed or agreed with each statement. 20 percent of the participants responded neutral to the last statement asking if the lesson plan will help them. However, no participant responded negatively (disagree or strongly disagreed) on any of the Likert scale attitudinal survey questions.

SA (strongly agree), A (agree), N (neutral), D (disagree), SD (strongly disagree)	**SA**	**A**	**N**	**D**	**SD**
Instructional delivery					
1. The length and pace of the instructional module was appropriate.	70%	30%	0%	0%	0%
2. The steps were broken down into appropriate chunks and chapters.	90%	10%	0%	0%	0%
3. Visuals used in the instructional module were helpful.	50%	50%	0%	0%	0%
4. Onscreen text used in the instructional module was helpful.	50%	50%	0%	0%	0%
5. Audio narration used in the instructional module was helpful.	70%	30%	0%	0%	0%
6. The webpage helped to organize the content	100%	0%	0%	0%	0%
Content					
7. The instruction clearly explained pedagogical strategies when using SRS.	70%	30%	0%	0%	0%
8. The instruction clearly explained educational benefits of using SRS.	80%	20%	0%	0%	0%
9. The instruction clearly explained all elements of the Questioning Model and Mechanism.	70%	30%	0%	0%	0%
10. The instruction clearly explained all elements of Active Learning Strategies.	70%	30%	0%	0%	0%
11. The instruction clearly explained all elements of Backward Designing.	80%	20%	0%	0%	0%
Personal Outcome					
12. I have learned many new pedagogical strategies on how to use SRS effectively.	50%	40%	10%	0%	0%
13. I now understand there are many educational benefits of using SRS.	60%	40%	0%	0%	0%
14. I am now more likely to use SRS in my classroom.	60%	30%	10%	0%	0%
15. I feel more comfortable and confident about using SRS in my classroom.	30%	50%	10%	0%	0%
16. I feel students will be more motivated when SRS are used.	70%	30%	0%	0%	0%
17. I feel students will be more engaged in the learning process when SRS are used.	60%	30%	10%	0%	0%
18. The Interactive SRS Lesson Plan Template will help me when integrating SRS in my classroom.	50%	30%	20%	0%	0%

Figure 3. Attitudinal survey

Another component of the attitudinal survey was the open-ended questions. Eighty percent of participants stated they would recommend this project to their colleagues. Many participants stated that SRS would be a great tool to engage students. One participant remained skeptical about its benefits and stated it is a luxury rather than a need. In response to the question, "What was most beneficial" some stated realizing the benefits and learning about the models. Some suggestions were provided, including shortening the template, making handouts less confusing, offering hands-on demonstrations and practice, and providing additional resources. Seventy percent of participants commented on the module's effectiveness, professionalism, and informative nature. Forty percent of participants stated they were impressed with the amount of information provided and quality of the work it took to develop the module.

The Instructional Design Process: A large part of this project was the instructional design process itself. The process involved four iterative revisions to both areas of content and design. A major time consuming process was determining exactly what content should be included and what prior knowledge the participants possessed. Since a lot of entry-level skills were needed to successfully meet the terminal objective, such as lesson planning, backward design, and actively learning strategies, no assumptions were made about prior knowledge of participants. In terms of content, a total of four complete revisions were conducted, these revisions included three prior to the one-on-one reviewer and one after that feedback. The fourth revision was the version participants received. Using the Instructional Design process and the ADDIE model helped in providing scaffolding and sequencing theories that helped to appropriately create a hierarchy of objectives. Also the Instructional Design elements helped in the process of analysis and evaluation.

A lack of funds and resources limited the researcher to either open software design programs or programs that were previously available. Hence, recording, editing, and converting files became problematic at times. In terms of the design process, revising became an ongoing process from beginning to the very end.

Implications

Most participants in this study have agreed that they have learned pedagogical and implementation practices that will enable them to be successful users of SRS. As a result of this project, participants have indicated their ability to design effective questions, produce productive classroom usages, and integrate SRS effectively in their curriculum.

As purported by Betty (2004), this study demonstrated that participants realize that when SRS is used in conjunction with effective peer instruction strategies and best pedagogical strategies, students become more involved in the learning processes and have a sense of personal ownership over their contribution to the class. Participants agree that ongoing formative assessing is feasible with the use of SRS. SRS enable both the teacher and student to receive immediate feedback, which allows for timely remediation and contingent teaching and helps the student monitor their comprehension and self assess their understanding. Didactic routine lectures often fail to engage all students in the

learning process (Homme, Asay, & Morgenstern, 2004). Using a much more interactive approach such as implementing SRS has deemed to be a more effective method of instruction. Although much research remains to be done to explicate why SRS are effective tools in the classroom, participants agree SRS appears to enhance learning by creating an active learning environment, increasing participation, and increasing student engagement (Caldwell, 2007).

Conclusion

As stated previously, purpose of this instructional design study was to explore whether teachers can effectively create a lesson plan using the Interactive SRS Lesson Plan Template. Specifically, the intent of the module was to demonstrate the benefits of using SRS and encourage teachers to implement SRS into their daily routines. The responses from the attitudinal surveys and the results from the pre, embedded, and post test are evidence of the module's positive influence in increasing teacher motivation and proficiency of implementing SRS. One hundred percent of participants either strongly agreed (80%) or agreed (20%) that the module clearly explained to educational benefits of SRS, which is evidence that every participant gained new knowledge of SRS educational benefits. Eighty percent of participants either strongly agreed (30%) or agreed (50%) that they feel more comfortable and confident using SRS, which indicated that the module encouraged teachers to implement SRS into their daily routines. However, the researcher postulates that the reason more participants responded "agree" than "strongly agree" to this question may be due to the lack of hands-on practice. Nevertheless, this project met its goals in providing participants with skills needed to successfully integrate SRS by demonstrating the potential benefits of using SRS through the process of using the SRS Lesson Plan to create a lesson. The results of the attitudinal surveys supported the hypothesis that participants believe that using SRS in the elementary classroom environment would improve feedback to students, improve the learning environment, and enhance learning and engagement.

Several future considerations for this project include live demonstrations and changes to the instructional design team. Given more time and resources, a live demonstration could be very valuable to the participants because it would offer them a real experience demonstrating the true value of SRS and with any technology, it is helpful to demonstrate how the hardware works as well. In addition, offering a more hands-on approach and allowing participants the time to practice using SRS may enhance and strengthen overall understanding. Also, individuals with more technical skills such as a computer programmer and graphic designer could have added more polish to the final module. More sophisticated software, such as animation software, could have enabled creation of a more engaging and aesthetically pleasing module.

Overall, this instructional design project met or exceeded all of its goals. As digital immigrant teachers become more proficient in the many different kinds of technologies like SRS available for the classroom, they may be able to stimulate more interest and participation from the digital native students. This project, as a whole, helped to address the growing need to integrate technology effectively in the elementary classroom.

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